Reusable Suborbital Sounding Rockets and Their Applications

Reusable Sounding Rocket Concept: The U.S. Naval Research Laboratory and TGV Rockets Inc. are currently developing a reusable sounding rocket called the Modular Incremental Compact High Energy Low-cost Launch Example (MICHELLE-B).

The MICHELLE-B concept is designed to launch straight up, carry a 1000 kg payload to 100 km altitude, and return to the launch site 10 minutes later. Once it has landed, it can be refueled, checked out, and relaunched within 3 hours.

Military Applications: This system will provide the launch-on-demand tactical capabilities of an Unmanned Aerial Vehicle (UAV) with the large payload volumes and comparable altitudes provided on spacecraft. Its reusable nature also allows laboratory style equipment to be tested in a relevant environment prior to developing miniaturized and/or low power payloads of UAVs or spacecraft.

Three application concepts have been developed and are currently being studied by NRL.

- **Imaging**: Existing tactical imaging systems such as the TARPS pod could be adapted to provide high-resolution visible, multispectral and hyperspectral imagery at various wavelengths from high altitudes. High altitudes allow a large region to be imaged from a given launch sight, allowing launches from friendly territories to image denied areas.
- **Lasercomm Test Platform**: NRL is currently developing a ship-to-ship lasercomm system to allow covert communications. In over-the-horizon applications, a high altitude relay platform will be required. Demonstrating this capability, however, could be achieved today by placing existing laboratory development equipment on this kind of vehicle.
- **Data Infiltration/Exfiltration**: Many small UAVs may be deployed from the rocket at high altitudes. These UAVs can then glide or be actively flown into denied areas to disperse data collection devices such as magnetometers and chem/bio detection sensors. The same rocket can be used later to interrogate and receive data from these sensors.
- **Ballistic Missile Target Simulation**: The MICHELLE-B is easily capable of coproducing low-cost-on-demand high-fidelity simulations of missile launch or end-game scenarios at theater and strategic conditions.
- **Micro-satellite Launch**: NRL is studying use of the MICHELLE-B to launch 50-lbs-class payloads into low-earth-orbit on demand.

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